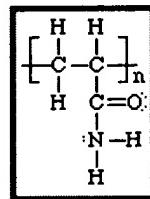


EXHIBIT A

poly(acrylamide)



Polyacrylamide is used for water treatment and paper manufacturing, and in applications requiring water soluble polymers.

Properties of Acrylamide Monomer

sight	white, solid crystals
molecular weight	71.08
melting point	84 deg C
density	1.122 g/ml at 30 deg C
solubility in acetonitrile	40 g/ 100 ml at 30 deg C
solubility in acetone	63 g/ 100 ml at 30 deg C
solubility in benzene	0.346 g/ 100 ml at 30 deg C
solubility in ethanol	86 g/ 100 ml at 30 deg C
solubility in water	215 g/ 100 ml at 30 deg C

Synthesis of acrylamide monomer:

1. react acrylonitrile sulfuric acid in an aqueous solution, and then separate acrylamide out using a base.
2. hydrate acrylonitrile using a fixed-bed copper catalyst.

In one example of this, a reduced CuO-Cr₂O₃ catalyst was used at 85 deg C in a continuous fixed-bed reactor using a 7% solution of acrylonitrile in water as the feed, with near quantitative conversion.

U.S. patent 3,631,104 (1971) C. E. Habermann, B. A. Terfertiller (Dow Chemical)

Polymerization of polyacrylamide

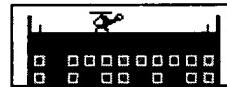
- o If heated above the melting point, acrylamide may polymerize. Caution, the reaction is exothermic.
- o Acrylamide may be polymerized in water at concentrations from 8- 20%, using AIBN, peroxide, or redox catalysts. Reaction times may range from 4- 8 hrs. Temperatures from 20 to 50 deg C are common. CAUTION: This reaction may be exothermic. It is recommended that you follow a specific procedure (DON'T MAKE ONE UP using the information you see here.) Even if you are following a procedure, use caution--assume the reaction may run away from you.

Water solubility of polyacrylamide

Poly(acrylamide) is infinitely soluble in water. In a way this is counterintuitive because we are accustomed to thinking of a polymer solution as consisting of a polymer dissolved in some small molecule substance.

If you keep adding polyacrylamide to water, eventually you pass a point where there is more polymer than water, and then you have a solution of water dissolved in polymer. I believe in this scenario, the term "infinitely soluble" means there will be no phase separation.

On the other hand, if you have a polymer and solvent where the polymer is not infinitely soluble, there is a point where if you pass that point, and then let time pass, the polymer and the solvent media will phase separate.



Last Update- July 9, 1995- wld
